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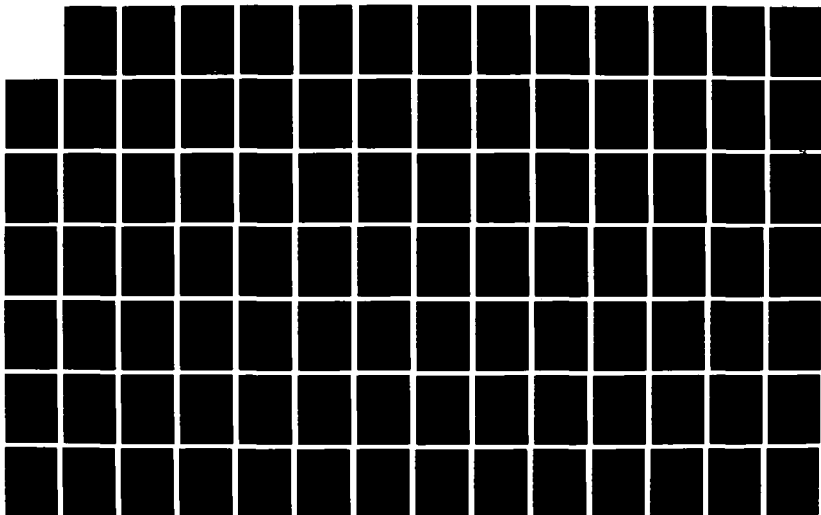
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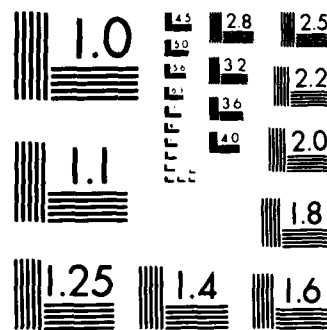
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MEDICAL CASE MANAGEMENT
IS IT COST EFFECTIVE FOR THE EMPLOYER?

A THESIS SUBMITTED TO THE FACULTY
OF THE PROGRAM IN HOSPITAL AND HEALTH CARE ADMINISTRATION
OF THE UNIVERSITY OF MINNESOTA

By

Dennis James Swartzbaugh

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE MHA DEGREE

June 1987

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ABSTRACT

SUBJECT: Cost Effectiveness of Catastrophic Case Management

TITLE: Medical Case Management: Is it Cost Effective for the Employer?

AUTHOR: Dennis J. Swartzbaugh

ADVISOR: Dr. Theodor J. Litman

RESEARCH SITE: A Fortune "500" company
Nationally known case management firm

PURPOSE OF STUDY: The purpose of this study was to answer two questions: 1) Is case management cost effective from the perspective of the employer? and 2) What variables will explain the net savings realized by the employer? Findings may be useful in changing the selection criteria to identify possible cases for management.

METHODS USED: Data were collected from the records of the employer and the case management firm on 70 patients that had been managed from 1985 through April 1, 1987. Chi-square tests were performed on each of the independent variables in association with the dependent variable, net savings. Three multiple linear regressions were performed with all the independent variables. The first regression was run with all the cases. The second regression used only the negative values of the dependent variable. The final regression used the remaining positive values for the dependent variable.

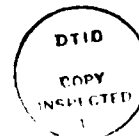
SIGNIFICANT FINDINGS AND CONCLUSIONS: Case management is cost effective for the employer. In this study for every \$1.08 spent on case management services, \$4.83 was saved based upon the projected savings in medical expenses. This return is accomplished with 70% of the cases resulting in "negative net savings". This indicates that more stringent selection criteria should be used in identifying cases for management. The time from the date of referral to the date of onset (time a case is opened) was found to be significant in both the Chi-square analysis and each of the regressions. The time a case is opened is a large explainer of the variance in the dependent variable "net savings".

RECOMMENDATIONS: Further study is needed to provide additional information in identifying good predictors of positive net savings. Case management firms should begin now to build accurate and complete relational databases for future needs.

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PREFACE

This thesis represents an effort to identify variables predicting specific cases which, if managed would result in a "positive net savings" to the employer. The question of cost effectiveness to the employer was addressed using the management fee data and the projected savings associated with 70 cases.

A number of people have assisted the author in completing this project. Mary Foley provided special words of encouragement and an undying enthusiasm for the project. She provided the inspiration to keep the project interesting and the author motivated. Candace Dow provided a basis for reality when trying to limit the scope of this research. Thanks to Lynne Tonsfeldt for her help in getting the data to do this study.

Theodor Litman, the author's academic advisor, provided wisdom, patience, commitment, and the ability to read and skillfully critique a number of drafts before the final version was prepared. Without Dr. Litman's help, this study could not have been written. Many thanks to Vernon Weckwerth, for his willingness to provide advice and criticism at those crucial points during this study.

Special thanks to Dean McWilliams for programming all of the runs needed for the analysis. Again, without his help, this study could not have been written.

Lastly, I am sincerely grateful to my wife Vickie and daughters Andrea, Sarah, and Megan, for understanding the time required to complete such a project.

Minneapolis, Minnesota
May 27, 1987

Dennis J. Swartzbaugh

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Chapter 1

INTRODUCTION

1. Increasing Health Care Costs

Over the past several years, the cost of medical care has risen to a point that employers and employees alike are concerned. In the United States the cost of care is over one billion dollars each day.[1] Looking back several years one can see the percentage of the gross national product (GNP) diverted to health care increase from 4.4 percent of (GNP) in 1950, to 8.6 percent of GNP in 1975, to 10.8 percent of GNP in 1983.[2]

With an increasing percentage of the GNP being devoted to health care, it is important that one insures that these resources are being well spent. Over the past several years, it has become evident that as much as 20 to 30 percent of the total health care cost is not well spent.[3]

1 John Naisbitt and Patricia Aburdene, Reinventing the Corporation, p. 181.

2 Theodor J. Litman, "Health and Health Care in the United States; Some Facts, Figures and Observations," Fall 1985, p. 1.

3 Helen Darling, "Charting the Progress of Cost Containment," p. 30.

"The health system has not been challenged to increase productivity, although most experts believe there are many opportunities to do this."[4]

To bring these abstract concepts and figures into focus, one should consider the following:

In 1984 Chrysler's healthcare costs will exceed \$400 million, making the Blues Chrysler's single largest supplier. That's more than \$1.1 million each day. This year Chrysler's total healthcare bill (which includes Chrysler's Medicare payroll tax and a portion of the health insurance premiums of its suppliers) will exceed \$550 for each car we sell. . . . This year Chrysler must sell about 70,000 vehicles just to pay for its healthcare bills.[5]

Corporate expenses for health care are rising at such a fast rate that, if unchecked, in eight years they will eliminate all profits from the average Fortune "500" company and the largest 250 nonindustrials. From 1981 to 1983, the average rate of increase of health insurance premiums for these companies was a staggering 20 percent, and health care costs amounted to 24 percent of average corporate profits after taxes. Although the rates of cost increase moderated in 1984, their growth was still much higher than that of the Consumer Price Index.[6]

As insurance premiums for companies have increased steeply, many corporations began to self-insure. The self-

4 Ibid.

5 Joseph Califano, "The Great American Shell Game: Controlling Healthcare Costs," p. 66.

6 Regina Herzlinger and Jeffrey Schwartz, "How Companies Tackle Health Care Cost: Part 1," p. 69.

insured employer began investigating ways to reduce health care costs. Several of these methods are examined below.

2. General Cost Control Methods

A corporation like Chrysler or any other large company, has a definite interest in trying to control health care costs. According to Collings, there are two reasons for the rise in health care costs: "excesses and those which merely reflect the high and escalating price for health services." [7] To impact the cost of health care effectively, corporations must pursue two approaches to the problem. First, to affect the excesses experienced in health care, more effective case management is essential. Secondly, in order to have an impact on the increases due to escalating prices, "efforts must be directed through health care structures and aimed at reducing the growing rates charged for services." [8]

In the process of trying to contain costs, it is essential not to lose sight of the overall picture. A corporation's financial position is important. In respect to health care, attention to the development of long term

7 Galbeart H. Collings Jr., "Managing the Health of the Employee," p. 15.

8 Ibid.

strategies that will reduce health care costs for the entire system is equally important.[9]

As corporations realize where the most immediate impact exists, they will initially focus attention on actions which will produce results in a relatively short period of time. This becomes obvious when the magnitude of the problem and the potential immediate savings become apparent. A long term solution that will benefit all parties is pursuing those factors which fuel the escalating prices for health care services. Once short term actions are identified and implemented, the corporation must focus on the development and implementation of long term strategies.

The broad spectrum of possible cost containment actions by employers to contain (and reduce) employee health care costs can be categorized into three main strategies: 1) motivating employees to change their demand for health care via changes in the design and administration of health insurance policies; 2) changing the structure of the health care system by such mechanisms as alternative health delivery systems and participation in business coalitions, and 3) promoting programs that will help lower the need for health care, through reducing hypertension and stopping smoking, for example.[10]

Of the three strategies noted above, the first two (changes in design and administration of health insurance

9 "Selected Cost Containment Strategies, A working Paper Prepared for the Employer Corporate Councils' Cost Containment Committee," p. 2.

10 Ibid., p. 1.

and introduction of alternative health delivery systems) are of general interest to this study. One attempt to control the health care industry is the prospective payment system, better known as diagnostic related groups (DRG's). This is a system of categorizing the patient by the primary diagnosis and reimbursing the treatment facility based on the average or slightly below the average cost for that particular service. This has slowed the increase in medical care expenditures but it is difficult to determine how much, since at the time the DRG system was introduced, the cost of medical care was already on its way down.[11]

The DRG system moreover does not affect all purchasers of health care. The government uses the system in controlling costs for the Medicare/Medicaid population. Other segments of health care still operate on a fee-for-service system.

3. Options Controlling Cost

The question then becomes, what can the average employer do to help control the cost of medical care for his/her employees? A number of options are available, some more attractive than others.

11 Alan Johnson, Council of Community Hospitals, Lecture, June 2, 1986.

4. Benefit Package Modification

In the late 1970's and early 1980's some companies began a modification of their employee benefit packages. Instead of paying 100 percent of the costs of health care, many companies shifted the first dollar coverage to the employee in the form of deductibles and copayments. This was somewhat successful from the employer's perspective. On the other hand the employee saw his/her disposable income decrease. Cost shifting had taken place. Moreover this resulted in little savings to the overall system of health care.

5. The Development and Enrollment of Employees in Health Maintenance Organizations

Another option tried was the development and enrollment of individuals in health maintenance organizations (HMO's). This was an attempt to enroll groups of people into an organization that would control the use of the health care system by placing the provider of the care at risk. For this risk, the HMO would accept a capitated fee for each enrollee. That amount would be paid whether the individual used any health care or not.

Employers thought employees who used an above average amount of health care would select the HMO's. This would allow the employer to budget the health care cost of the

patient by making fixed monthly payments to the HMO, independent of the amount of care received.

6. The Problem of Adverse Selection

The second anticipated response was for the employees consuming very little health care, to select the indemnity option. This in effect would allow the indemnity rates to decrease over time due to very little use of the insurance. In general, what actually happened was the opposite of the anticipated response, thus adverse selection.

The reason for adverse selection in the insurance market is that those patients using an above average amount of health care elected to stay with the indemnity plan in order to assure continuity of care by their current physician. Younger employees and, in general, employees not using an above average amount of health care elected to join HMO's.

Some studies have shown that adverse selection has taken place in the health care insurance market.

The problem of adverse selection is considerably eased if the insurance company insures an entire group that has been formed for reasons unrelated to insurance; for example the employees of a company.[12]

12 Joseph Newhouse, The Economics of Health, p. 21.

So, what can be done? How can the employer afford to provide health care to employees in the future and remain a viable, competitive organization? One answer is through case management.

Case Management

1. Defining Case Management

With the increased emphasis being placed on case management, the casual reader might think it is a new concept. The concept has been around for years. In the early 1970's, case management first appeared in the social welfare literature. Specifically, case management has its roots in the mental health field.[13] In the past it was practiced informally by various professions. The new twist in case management for today is the fact it is a more formalized activity and in many instances a reimbursable service.

In 1971, the United States Department of Health, Education, and Welfare, funded the first case management demonstration project. The goal was to test different mechanisms to integrate health and social services. Case management was one of the mechanisms tested.[14]

13 Lois Grau, "Case Management and the Nurse," p. 372.

14 Jeffrey C. Merrill, "Defining Case Management," p. 5.

* Case management is a process used by employers to oversee and coordinate the medical care received by patients. The purpose is to provide a tailored plan of care for the patient that will reduce the recovery time and minimize the cost of care.

Case management is a process of planning, communicating, and coordinating the appropriate resources necessary to respond to the health care needs of the individual.[15] The process brings together the right people, in the right place, at the right time, to provide the right services to the patient. *There* ←

Most agree that the hallmark of true case management is the mobilization of the appropriate resources for patient care over the course of a person's illness. Thus, instead of simply denying care, case management aims to rationalize the care patients receive.[16]

For the patient who tries to figure out a complex health care system hopefully there to provide for his/her needs, case management may be the only way to put some order into the unordered system.[17] Many patients at the time of needing services are not in a position to learn how the system can work to meet their needs.

15 Grau, p. 373.; Bruce Spitz, "Medicaid Case Management: Lessons for Business," p. 16.; Merrill, p. 5.

16 Darling, p. 7.

17 Polakoff, p. 52.

Intuitively, one would believe that this type of action would be cost effective. If a patient can be moved out of an intensive care unit (ICU) two days ahead of schedule (as a result of case management intervention), then the savings realized would be real. This would be true if the patient did not develop complications or have to return to a higher level of care because of the intervention.

2. Employer Attitude

As indicated above, case management is believed to have a real potential to affect dramatically the cost employers pay for health care. In 1983 a survey of the nation's 1,500 largest employers was conducted. At that time only 2 percent or 30 employers used case management. One of the reasons for such a low utilization rate was the reluctance for the employer to become involved in the employee's personal life.[18] As costs continued to rise, employers began to decide that the potential for savings was worth a change in the attitude of the company.

As companies realized the inefficiencies in the health care setting, they began to seek methods to provide some relief. Employers began turning to case management services starting about 1983, even though the services were available

18 "Selected Cost Containment Strategies, A working Paper Prepared for the Employer Corporate Councils' Cost Containment Committee," p. 7.

in the mid 1970's.[19] Making the commitment to case management can be a major change in the corporate philosophy of many companies.

The most important decision plan sponsors make in considering case management is whether the company is ready for it, and whether incorporating it into the existing structure is manageable. One factor that influences this decision is the organization's culture. For companies that have had little historical involvement in employees' lives, life styles and episodes of medical care, introduction of case management needs to be planned carefully since the changes involved could be misinterpreted. Internal infrastructure (managers, supervisors) should be identified, involved in the changes and well-equipped to support the new activity. In addition, senior management (and, where applicable, union officials) must be both solidly behind the concept and visibly in support of case management implementation and use."[20]

Based upon conversations with a case manager, it is estimated that today over 30 percent of the 1,500 largest employers have some kind of case management system.[21] This varies from in-house systems to one provided by a professional case management firm and all variations between the two extremes.

19 Dave Lenckus, "Case Managers Can Cut Cost of Catastrophic Care: Experts," p. 11.

20 Hembree, p. 13.

21 Lynne Tonsfeldt, Medical Case Management Product Manager, Intracorp, Conversation on 12 April 1987.

3. Case Management Helping the Employer

Once a company decides it can no longer afford the hands-off approach to medical care, what will case management do to help the employer control costs while providing quality care?

As one reviews the literature, case managers have two goals which the majority of high cost case managers view as complimentary: cost containment and improved quality of care.[22] In an attempt to make these two goals complimentary, case management firms perform the following activities: 1) seek out alternative settings and providers, 2) coordinate the sequence of care, 3) develop a plan of care best suited for the patient and then arrange for coverage if necessary, and 4) monitor the progress of the case making recommendations to change the course of action as the situation progresses.[23]

These steps are important in accomplishing the goals of both the case management company and the employer. It is necessary however for the case manager to become involved at the earliest possible time to enhance the chances of attaining both goals.[24] As the time from the incident to

22 Mary Henderson and Stanley Wallack, "Evaluation Case Management for Catastrophic Illness," p. 7.

23 Ibid., p. 8.

24 Jackie M. Mazoway, "Early Intervention in High Cost Care," p. 12.

the introduction of a case manager increases, the chances of substantial savings decreases and the rehabilitation process is delayed and sometimes slowed.

Case management can successfully minimize the number of admissions, or the length of stay for patients who have a chronic pattern of acute care use, or both.[25] This is essential when one realizes approximately 20 percent of the cases account for approximately 80 percent of the total health care costs for the company.[26]

4. Catastrophic Case Management

In considering catastrophic case management, there are essentially two distinct types of cases: 1) a sudden unanticipated event such as an accident or stroke and 2) a chronic condition which stretches over a long period of time. The chronic type of catastrophic case is usually either one of two kinds; a medical or psychiatric condition.[27]

The catastrophic cases are such that management can be successful once the case is identified. The current problem is designing procedures which allow a case management firm

25 Gerald Eggert, Meg Delaney and Bruce Friedman, "Employer Options to Finance Long-term Care," p. 15.

26 "Selected Cost Containment Strategies, A working Paper Prepared for the Employer Corporate Councils' Cost Containment Committee," p. 8.

27 David L. Rosenbloom and Paul M. Gertman, "An Intervention Strategy for Controlling Costly CARE," p. 18.

to become involved within 24 hours of an incident. This might be done by requiring notification of the employer at the time of admission. This would allow the necessary resources to be identified and mobilized at the earliest possible time to do the most good.

5. Expedite Discharges

Another use of case management is to expedite discharges from acute care hospitals. When a case manager becomes involved in a case, the awareness of the care givers is heightened. The providers are aware that the employer of the individual is interested in the outcome of the case and believes there to be a potential for savings. As case managers explore alternatives to acute care hospitalization, the provider will allow early discharge provided the medical care of the patient is not compromised.

6. Expedite Use of Step-Down Units

When a patient can be transferred from a high intensive unit to a less intensive unit, the case manager is able to make available more appropriate care at a decreased cost. Also, if at the time the patient should be transferred to a less intensive unit, that step-down unit is full and the patient remains in an intensive care unit, the case manager is able in some cases to have the daily charge reduced from

the more expensive ICU charge to the less expensive step-down unit charge.

7. A Case Management Example

Zenith corporation has narrowed its focus on the case management issue. Prior to any hospitalization, the Zenith employee is required to contact the medical service advisor (MSA) to provide basic information. Based upon information such as the estimated length of stay, the day of admission, the procedure to be done, and the hospital to be used, the MSA makes a determination if guidance would be appropriate in helping the patient make a decision that is the most cost effective for the specific situation. If the possibility exists to provide quality care and reduce the cost, either the medical service advisor or the patient will discuss other options with the physician.[28]

As a result of the actions taken by the MSA, the employees view the MSA activity as one of a patient advocate, responsible for both saving them money and helping them through the complex medical care system. The results have paid off. The employees believe they are receiving quality medical care while the company has realized a

decrease in health care costs of 6.2 percent in 1983 and an additional eight percent decrease in 1984.[29]

8. Projected Return for Using Case Management

Companies which use a case management firm can expect a 10 to 1 return on the cost of the service provided according to case management firms.[30] However, a manager must realize that the potential is there that the cost of the management services will offset the savings generated. This is even more the situation if inappropriate cases are selected for management.

Case management is like other services one contracts for in the sense that the success of case management of a case in general is dependent upon how well the plan was formulated and the amount of cooperation between the parties involved.[31] Both of these factors are critical to the success. It is true that an exceptionally well designed plan can compensate for less than ideal cooperation and vice versa. However if the plan is incomplete or cooperation is inadequate, one can anticipate failure.

As described above, case management has a real potential to help the employer decrease his/her health care

29 Ibid.

30 Lenckus, p. 10.

31 Henderson and Wallack, p. 9.

costs, provide a service that at the same time educates the employees, and can actually improve the appropriateness of care.

9. Users of Case Management

One should keep in mind that case management is not for every firm. Only 1 to 3 cases per 1000 insured employees become a high cost case. Knowing this, it is unusual for companies of less than 500 employees to purchase case management medical services.[32]

Even though case management is not for every company, a few studies have shown that a few high cost cases in the population can play havoc with the firm's total cost of health care. One study pointed out that a few patients and a few conditions (less than 10) can and often do account for more than 75 percent of the plan's utilization.[33] Other studies have shown that within defined populations, less than 1 percent of covered employees incur between 25 to 50 percent of the costs.[34] The major difficulty is to identify the high users so they can be managed. A good rule of thumb an employer can use is that within any given

32 Ibid.

33 Hembree, p. 11.

34 Henderson and Wallack, p. 7.

population, 20 percent of the claims account for 80 percent of the cost.[35]

According to a report provided by the Congressional Budget Office, "only 5 percent of nonpoor, nonelderly families incur more than \$5,000 (adjusted to 1982 dollars) in medical expenses a year, and less than 2 percent of such families incur more than \$10,000 in any year." [36]

The question remains of how to identify potential high cost cases. According to David Rosenbloom and Paul Gertman, a company can identify its high cost users for a given year by looking at who the high cost users were during the previous year. This group changes a little from one year to the next, but over a three year period, the similarities are striking.[37]

Further research needs to be conducted to see if this holds in a majority of cases. It makes sense that the chronic user could be identified based on the past year's high cost users. However, one potential problem companies will be facing is gathering the data in a form that can be used to identify the high cost users. Unless corporations are using relational databases (databases that will support

35 "Selected Cost Containment Strategies, A working Paper Prepared for the Employer Corporate Councils' Cost Containment Committee," p. 8.

36 Rosenbloom and Gertman, p. 17.

37 Ibid.

high level query languages, i.e. a one line statement will replace about 200 lines of code in a COBOL program) to store health care cost information for each employee, getting a report of the high cost users will be time consuming.

10. Cases to Manage

It would not be practical, possible, or desirable to manage every case. One way of determining which cases to manage is by selecting a dollar figure. Once that amount in health care charges is exceeded, the case would be managed. This will vary among different companies. One figure commonly used is \$10,000. Once a case costs the company that amount of money, it is automatically managed. The reason is that the probability of having a high cost case is greatly increased once the charges have gone over \$10,000.[38]

The object for the employer is to identify those cases which will become high cost. Conditions that fall into this category would include prolonged episodes of care, serious burns, organ transplants, neurologic, psychiatric, cardiovascular and respiratory conditions, major head trauma, spinal cord injuries, amputations, neonatal high-risk infants, severe strokes, and major accidents.[39] Once

38 Ibid.

39 Mazoway, p. 12.; Lenckus, p. 10.

the employer has identified a case for possible management, the case manager should ensure that the proper treatment facility is being used.[40]

In the process of keeping an eye on the financial costs of care, appropriate care is the primary concern. Patients with some of the specific problems mentioned above fair better when treated in a regional specialty center. The case manager has more of an incentive to ensure the individual is receiving the most appropriate care. Delays increase the possibility for complete recovery and cost more resources because inappropriate resources are being consumed. This is one of the reasons proponents of case management stress early intervention.

Early intervention minimizes the acute care costs by rapid transfer to the appropriate specialty center at the earliest possible time. This type of concern on the part of the case manager, translates into a feeling of security for the patient and family. Knowing that someone who knows how the system works, and in many cases is more knowledgeable about the specific condition of the patient than the actual care providers, is a real comfort to most people.[41]

The responsibility of the case manager is to manage the patient to a point of maximum potential recovery. In this

40 Mazoway, p. 12.

41 Lenckus, p. 11.

way the cost to society in general is driven to the minimum level possible. This situation is then a true service to the patient, the family, the employer and to society in general. Every successful case that conserves resources, allows utilization of those resources in other ways to satisfy the diverse needs of society at large. This is another reason to selectively identify cases for possible management.

Case management is also concerned with accelerating the care provided as much as medically possible. This reduces the physician and medical service charges and returns the patient to work sooner.[42]

Another group of cases for potential management are the heavy users. To impact the total cost of health care and to decrease health care costs for the employer, it is important to change the behavior of the heavy user.[43]

18 percent of the adult population are heavy users, that is, those who are hospitalized during the course of a year as well as those who see a physician at least 10 times during the same period.[44]

42 Ibid.

43 Equicor/Louis Harris and Associates Inc, "A survey of Hospital Patients and Other Heavy Users of Health Care Services," p. 8.

44 Lisa Lopez, "Survey Shows Where Heavy Users Fit in Health Care Market," p. 10.

In an effort to change the behavior of the heavy user it is important to understand the characteristics of heavy users so they can be identified for possible management. One method of identifying some of the heavy users is to set up specific numeric criteria or other conditions to indicate when a case should be considered for case management. Cases can be referred under the following conditions; if the length of stay exceeds a maximum set by the company, if the primary or secondary diagnosis indicates the possibility of future complications, if the admission is a repeat admission within a specified time-frame for the same condition, and also if total charges are in excess of a certain limit.[45]

Improved data systems and increased specialization will lead to better targeting of appropriate patients and better case management protocols. There is little doubt that in the future catastrophic case management programs will be held more directly responsible for managing the expenditures of high cost patients.[46]

Prior to attaining a level of suggested sophistication, case management programs will have to develop and accurately maintain large databases on the cases they manage. Currently, basic information of the number of cases managed, the diagnosis and geographical locations are not being

45 Henderson and Wallack, p. 8.

46 Ibid., p. 11.

collected by many case management firms.[47] As competition in the case management market strengthens, firms must build large databases and provide statistical analysis of these cases to customers and potential customers alike.

11. Methods of Payment

As with any service, there are a number of ways to pay for case management services. Some firms charge a percentage of the paid claims of a company. Others charge an hourly rate for all services performed. This rate ranges from \$50 to \$150 per hour. Some companies do not charge until after an initial assessment to make a determination if the case should be managed. Some large insurance companies provide the service to their customers at no additional cost. Another variation of the method of payment is a set monthly fee charged for each employee in the company.[48]

As one can imagine, the different ways of paying for case management services produce different incentives for the management company. When a company is paid by the hour, the incentive is to spend as much time as possible on each case. This increases the billed amount and lowers the actual savings realized by the employer.

47 Ibid.

48 Ibid., p. 10.

On the other hand, when a standard fee per client is changed, the incentive is to do as little as possible. Any costs incurred by the management firm, decrease the amount of profit for the company.

What an employer wants is an incentive system that actually maximizes the savings as a result of case management. The way to implement this would be to shift the risk or part of the risk to the case management firm and pay them a percentage of the savings experienced. The difficulty at this time is that the savings figures being shown by the management firms are not totally objective. It would be very difficult for the case management company and the employer to agree on a dollar amount of savings for each case. As more data is collected and sophisticated analysis techniques are applied, it may be possible to arrive at what specific cases cost when managed verses not managed; a case management index for some subset of diagnoses comparing managed with unmanaged cases. This would provide a standard basis for assigning a dollar savings to each managed case. Naturally, one would have outliers, as in any system, that would have to be handled on a case by case basis.

12. Determination of Cost and Savings

In the area of savings, agreement would also be difficult. Not only is it difficult to determine the savings potential, but also in some cases the amount of

savings as a result of the intervention. First one should consider the savings potential of a case.

Several criteria are used to determine cost savings potential. Referral as close as possible to the onset of the illness or injury is considered to be important since many costs are incurred in a short period after the initial illness or injury date. Second, an assessment is made of the current medical treatment plan to judge its cost-effectiveness and appropriateness. If there is clear communication and cooperation among the patient, family, physician and benefits administrator, there may be little reason for involvement in a case management program.

The third factor involves the willingness of the patient to become involved in the case management process.[49]

The other component of savings that is difficult to determine is the actual amount of savings realized as a direct result of the management activity. If a patient is discharged from the hospital five days earlier than the physician's original estimate, is that savings the result of the management company or the result of a conservative estimate by the physician? Depending upon the answer, the management company may not have generated the claimed savings. This issue is very difficult to untangle but is a necessary concern for the employer.

In general, data providing information on the savings needs to be as objective and factual as possible, reflecting the true situation of the management firms intervention.

49 Ibid., p. 9.

13. Structures of Management Firms

When one looks at selecting a case management firm, it is important for the employer to determine what specifications are to be met. The first of the specifications to consider is structure. The structure currently varies from one extreme where a case manager can accomplish all required tasks for a specific case to the other extreme where a number of case managers must be involved in each case to provide for the management of that one specific case. The latter is an example of a case manager not managing a case but actually managing aspects of many cases.[50]

In the situation where one professional manages all aspects of the case, continuity of care is maintained, the case managers are more highly educated, and also the number of people who have to be familiar with a specific case is decreased.[51] The problems involved with communicating to a number of outside agencies is difficult, but to overlay that process, the coordination of the communications necessary if three or four case workers are involved with the same case could greatly increase problems.

50 Cupitman, Haskins, and Bernstein, "Case Management Approaches in Coordinated Community - Oriented Long-Term Care Demonstrations," p. 400.

51 Ibid., p. 401.

With the extreme variation in the responsibilities of the case workers, due to their education, comes an understandable variation in the cost of case management services. Case management firms using people who can manage all aspects of a case are definitely the more expensive on an hourly basis.[52]

In addition to the cost issue, the employer must also consider another aspect. If something goes wrong, who is responsible? In the situation with multiple case workers it is difficult to assign primary responsibility. Also the probability of having problems increases as the number of people involved rises. From the employers point of view, the question becomes how quickly can corrections be made to ensure similar problems will not happen in the future? It is easier to correct problems when the number of people involved is limited and responsibility is clearly assigned.

A final consideration is the skills of the people used as case managers. The information presented by Grau, indicates that when nurses are used as case managers, they are more versatile than a social worker. When critical decisions were required of the social worker, a nurse was used to integrate health services with the social service

52 Ibid., p. 402.

resources.[53] The social worker was not required to provide information when the nurse was the case manager.

14. Variety of Approaches in Case Management

Once the decision is made to provide case management, the next decision becomes whether to purchase the service from a vendor, provide the service from internal resources or a combination of the two.[54] As with any decision, there are advantages and disadvantages. William Hembree developed a guide employers can use to help make the right decision. This guide is presented in Figure 1.

As one would imagine, an internal program is less costly to the employer however a combination of both internal and external sources provide the firm with the greatest amount of flexibility. When making the decision of how to structure a case management program, the firm must consider a number of variables. These include the following: cost of the program, location of employees, the performance record of the case management firm, and the objective of such a program to include the return on investment expected by the employer.

As the employer begins to define his/her needs, it will become evident which structure will meet the defined

53 Grau, p. 374.

54 Hembree, p. 13.

objectives. Figure 1 can act as a guide in the process of deciding the best method for a particular employer.

A Guide for Employers: Which Approach is Best?[55]

Internal Program

- Less costly
- More extensive
- More flexibility, fast response to creative ideas
- Better sense of ownership and involvement
- Potentially more effective
- Better opportunity to monitor quality of medical care
- Employee appreciation not mitigated or attributed to others
- Case management communication becomes part of overall communication process

External Resources

- Often national in scope
- Avoids overhead cost, salaries, space allocations
- Already developed
- More streamlined in decentralized situations
- Better accommodates small employer
- Often can be implemented more quickly
- May shift any ill will created to external vendor
- Can be part of other health services
- Usually uses sophisticated evaluation protocols
- Full staff back-up

Combination

- Greatest flexibility
- Allows use of external sources as needed, development of internal capabilities for rest of services
- Retains caring, sensitive, hands-on approach
- Best return on investment in situations with local involvement

Figure 1

55 Ibid.

15. A Proactive Employer

The high cost of health care has caused the employer to become proactive, a definite shift from earlier attitudes of noninvolvement with patients private lives and episodes of health care.[56] One has to believe that as future areas of concern surface, the employer, based on the successes experienced in the health care cost containment war, will be less hesitant to become involved again. This type of activity must be viewed as a positive step by the employee. Eventually, the results of the long term efforts on the part of the employer will be felt by the employee through a reduction in the growth of health care expenses.

Problem Statement

Few studies have asked "Is case management cost effective from the employers perspective?" Although it makes sense that it would be, does the data support the intuition?

There are several ways to approach the question. The first is to look at the data available and compare the cost of the service and the projected savings as determined by the case management firm. Another approach would be to compare the cost of the service with a modified version of projected savings. The modified projected savings would be

56 Hembree, p. 14.

a lower value for some cases. Any savings identified but not the result of case management intervention would not be included in the analysis. This is a difficult issue due to the fact that it is hard to determine in many cases, whether the projected savings is the result of the management firm or another party. A third approach would be to match each patient who was case managed with a patient having the same diagnosis but not managed. One would also want to match as many variables as possible to ensure the real difference being managed verses unmanaged. The approach selected for this study is a combination of the first two.

The problem then becomes one of determining whether case management is effective for the employer. A more objective assessment of the savings of case management will help future companies make the decision as to whether or not to pursue this method of dealing with the rising cost of health care. If case management is cost effective, the next question is what criteria should be used to select the appropriate cases for management. This study is designed to examine both of these issues.

To examine the question of cost effectiveness, this study will examine the savings projected by the management firm to determine whether case management intervention was the cause of the savings. If the determination is made that a projected savings was not the result of the case managers intervention, then that identified savings will be

eliminated from the analysis. This procedure will provide a more objective basis to answer the question of cost effectiveness.

The second question of how to identify the appropriate cases for management will be to look at various independent variables which might explain the "net savings" experienced by the employer. Using a multiple linear regression technique, one can identify the variables which best predict the variance in the dependent variable, "net savings."

Importance to the Field

1. A Review of the Literature

A review of the literature revealed little published research addressed the question of the cost effectiveness of case management from the employer's perspective. Most of the information available on case management was not based on rigorous data analysis. Several of the articles looked at examples of cases where the employer saved a very large sum of money (approximately \$50,000 or more) due to case management intervention.[57] One study[58] and a reference

57 Lenckus, p. 11; Hembree, p. 12; Mazoway, p. 16.

58 Jeanne Mueller and Michael Hopp, "A demonstration of the Cost Benefits of Case Management Services for Discharged Mental Patients," p. 17-24.

to a second study[59] was found that considered the cost effectiveness of case management.

2. Psychiatric Case Management [60]

One might believe that when dealing with the human mind, the amount of savings would be greatly reduced. In fact, this was demonstrated in a study of 44 patients, (22 in the control group and 22 in the experimental group) conducted at a psychiatric hospital, with the projected saving based upon inhouse case management.

The mean number of days saved in hospitalization that can be attributed to case management services is 33.96 per patient. At \$102 per day, the current cost of inpatient care in state-operated facilities, the savings amounts to \$3,464 per patient per year.[61]

Once a discharged patient was assigned to the experimental group, the case managers worked with these patients on a regular basis. The savings realized in this instance were based on the case manager (a social worker) having a salary and not an hourly charge for services rendered.[62] The case management activity actually started upon the release of the patient from the hospital.

59 Darling, p. 32.

60 Mueller and Hopp, p. 17-24.

61 Ibid., p. 22.

62 Ibid.

3. Medicare Data

Results of another study, which focused on Medicare data, concerned itself with looking at the expenses of Medicare patients and the pattern of cost to the program bases upon the time of the patients demise. The results of this study showed a small number of people representing a disproportionately large amount of cost.[63]

The 1.1 million Medicare enrollees who died in 1978 comprised 5.9 percent of Medicare enrollment but accounted for 28 percent of program expenditures. Reimbursement per enrollee for those dying was \$4,527 compared with \$729 for those who survived. Of all Medicare expenses for persons in their last year of life 30 percent is spent in the last 30 days, 16 percent in the 60th to 31st day.[64]

In summary, one article reported that an employer can expect to see a 10 to 1 return on his/her investment as a result of case management. The only study which examined the cost benefit ratio showed a 2 or 3 to 1 return on psychiatric cases.

Reference to the second study shows that a small number of people represent a disproportionally large number of expenses. This information provides added motivation for the employer to identify the relatively small number of

63 Darling, p. 32.

64 Ibid.

employees consuming a disproportional large amount of benefits.

Research Questions

A tremendous amount of ground is left to be examined in the case management arena. With the data available and the general information presented, this study will focus on the potential cost savings to the employer and how to better identify those cases that should be managed.

The current study will provide additional information to the person interested in the cost effectiveness of case management. It will also help identify variables which play an important role in explaining the savings experienced by the employer. As employers become more sophisticated in identifying cases to be managed, the amount of savings experienced will most likely increase.

Intuitively case management has the potential of saving employers a tremendous amount of money by effectively managing selected health care episodes of employees. This study asks two questions; 1) Is case management cost effective for the employer? and 2) What variables predict cases that provide a savings to the company?

As a result of the review of the literature on case management a number of research questions were developed. They are the following:

- * Is case management cost effective for the employer?
- * Does one group of cases (mental health, medical, surgical, chemical dependency, or neonatal) lend to more savings than other groups of cases?
- * Of the different groups of people responsible for notifying the case management company of a case for management, is one group better at selecting cases which result in a "net savings"?
- * Is there a difference in the net saving experienced from cases identified as corporate or field employees?
- * Is the "net savings" for the employer more when the patient is an employee or a dependent?
- * Is "net savings" for the employer more if the patient has an acute or chronic condition?
- * Is "net savings" for the employer more if the patient is young, middle aged or old?
- * As the time from date of onset to date of referral increase, do the "net savings" experienced by the employer change?
- * Does the gender of a patient have any impact on the "net savings" experienced?
- * Does marital status of the patient have an impact on the "net savings" for the employer?

- * Does the length of time the management firm is involved in a case affect the "net savings" to the employer?

Conceptual Model

From the research questions a conceptual model was developed. For purposes of analysis each of the independent variables will be examined in trying to explain the dependent variable, "net savings". A general conceptual model (see Figure 2) where the independent variables are grouped and a second more detailed model (see Figure 3) where each of the variables are listed is presented below.

General Conceptual Model

Demographic Characteristics of Patients	+	Specific Case Characteristics	=	Net Savings
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Figure 2

Specific Conceptual Model

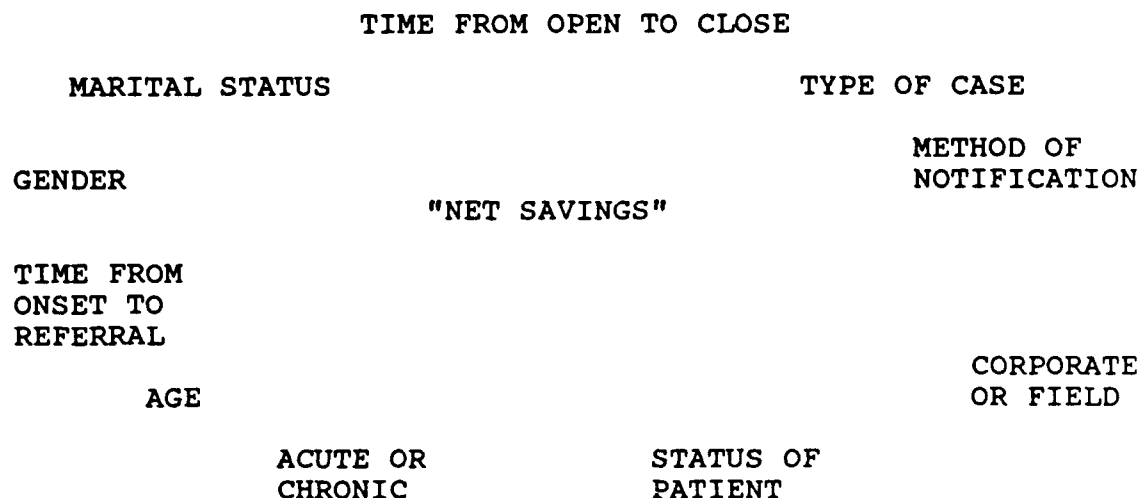


Figure 3

As with most relationships, there exists a number of factors that influence the actions of another variable. The purpose of this conceptual model is to identify those variables which this author believes has some impact upon "net savings".

The only variable identified in the literature as having a direct impact upon "net savings" is the length of time from onset to referral. The rest of the variables used in this analysis are based on the research questions generated.

Hypotheses

With the conceptual model above in mind, a set of hypotheses were formulated. Each hypothesis and its rationale are presented below.

H-1 Length of time from the date the case was opened to the date the case was closed. The length of time from the date the case was opened to the date the case was closed will be directly related with "net savings".

Rationale:

A management firm will not hold a case open to receive the hourly cost of managing the case if the potential for positive "net savings" does not exist. Doing this would cause the firm to lose its credibility and eventually its customers.

H-2 Method of notification. Method of notification is directly related to "net savings" when the notification comes through an occupational health nurse.

Rationale:

An occupational health nurse has the training and background that should help distinguish high cost cases from low cost cases. Based on this ability the occupational health nurse should be able to better predict a high cost case than other people who can refer to the management company.

H-3 Patients classified as corporate verses field.
The patients classified as corporate will be directly related to "net savings".

Rationale:

This is a classification made by the employer based upon the distinction of manufacturing and distribution being corporate while service after point of sale being field. With corporate employees working at major locations of the company, corporate employees have more support from other company services to include an occupational health nurse.

H-4 Classification of patients as employee verses dependent. Patients classified as employee will be directly related to "net savings".

Rationale:

A small proportion of the cases are of patients classified as employees. This group has a low proportion of people identified as having mental health problems. As the number of patients identified as employees increase, the amount of savings will increase, since the proportion of cases other than mental health will increase. This should lead to a larger return.

H-5 Patient illnesses classified as chronic verses acute. The number of chronic patients will be directly related with "net savings".

Rationale:

Acute cases are short lived episodes of sickness. This gives the case management company a short period of time to get involved with the case and have a positive impact on the savings. In many instances, chronic cases are over a long period of time. This gives the case management firm a longer period of time to become involved and have a more significant impact on the cost of care. Also with

an acute case, if the management company is not notified immediately, the potential for savings could be greatly decreased.

H-6 Age. Age will be directly related with "net savings".

Rationale:

Several issues lead to this conclusion. It is the authors belief that as the age of the patient increases so does the likelihood of a more serious illness. These illnesses are more apt to develop chronic conditions that would require the services of a case management firm.

H-7 Gender. Men will be directly related with "net savings".

Rationale:

It is the authors belief that men will not seek health care as soon as a women. Therefore the potential exists for "net savings" to be more for men than women.

H-8 Marital status. Patients who are married will be directly related with "net savings".

Rationale:

It is the authors belief that patients who are married and living with their spouse prior to and acute or chronic illness or condition, stand a more likely chance of returning home sooner than a person not married.

H-9 Type of case. Patients who are managed for each of the five conditions (surgical, medical, chemical, mental,

and neonatal) are likely to achieve a positive "net savings".

Rationale:

Catastrophic case management can come into action immediately after the incident has occurred. All five conditions are subject to this intervention and should result in positive savings.

H-10 Length of time from the date of onset of the medical condition to the date of referral to the management firm. The length of time from the date of onset of the medical condition to the date of referral to the management firm will be inversely related with "net savings".

Rationale:

Case management firms believe that early intervention is essential to realize the most savings possible and provide the best opportunity for speedy recovery. As the length of time from onset to referral increases the management firm will have less of an opportunity to provide a substantial savings to the employer.[65]

H-11 Using the entire set of values for "net savings".

A linear combination of independent variables given in the hypothesis above will explain the "net savings" of case management - and in the same direction as hypothesized above.

65 Mazoway, p. 12.

Rationale:

The relationship of each independent variable to the dependent variable has been given in a previous hypothesis and is believed to be the same when combined with other independent variables.

H-12 Using the negative set of values for "net savings". A linear combination of independent variables given in the hypothesis above will explain the "net savings" of case management - and in the same direction as hypothesized above.

Rationale:

The relationship of each independent variable to the dependent variable has been given in a previous hypothesis and is believed to be the same when combined with other independent variables.

H-13 Using the positive set of values for "net savings". A linear combination of independent variables given in the hypothesis above will explain the "net savings" of case management - and in the same direction as hypothesized above.

Rationale:

The relationship of each independent variable to the dependent variable has been given in a previous hypothesis and is believed to be the same when combined with other independent variables.

Chapter 2

METHODOLOGY

Study Design

Initially the study was envisioned as being an exhaustive look at case management from the perspective of the employer. A number of questions were developed, the most prominent being "Is case management effective in saving money for the company?"

In its origin, the purpose of this study was to determine the actual savings generated by the case management activity. As preliminary information was gathered it became obvious that the required information would not be available to the degree necessary.

The study was originally designed to take into account the actual cost of the care provided, associate the care with the primary diagnosis of the patient, consider the case management charges, and look at the projected savings as a result of managing the case. As one delved further into the actual workings of the system, the original design became unattainable.

1. The Study Population

Originally, it was felt that a sample size of 500 would lend a tremendous amount of credibility to the study. In putting together this size a sample, approximately 10 to 15 separate employers would have had to be contacted. Not all of these companies would have been in the local area. As a result of the large number of people that would be involved, the decision was made to concentrate on the employees of one company and develop information based on one employers cases.

The study focused on 70 individuals employed by a Fortune "500" company in the Midwest. Each case included in the sample met two criteria. First the case was referred to a case management firm for the possibility of managing the episode of care. Secondly, each case considered was closed by the employer or the case management firm before 1 April 1987. The clients ranged in age from newborn infants to 65 years of age. Although the employer was an international company, only employees and dependents in the United States were available for analysis.

The employer involved in this study had about 140 cases that had been referred for management over the past two years. Further investigation revealed that of the 140, the majority (85) were still being actively managed by the case management firm. Since the total invoiced amount and the total savings were key variables in the analysis, only cases

that were closed could be used. This reduced the size of the population to approximately 55.

Prior to doing the analysis, an additional 15 cases were closed and made available. This increased the study population to 70 cases.

Due to the fact the population was relatively small, the entire population was used for the analysis.

2. The Study Site

The study site involved a Fortune "500" company and a nationally known case management firm. The employer has approximately 65,000 employees throughout the United States. The company has about 3,000 employees located in the Minneapolis area.

The case management firm has offices throughout the United States in approximately 130 different cities. They currently employ about 2500 employees. At the present time this management firm is the largest case management firm in the United States.

During the entire study, personnel at both the employers company and management company provided necessary support.

3. The Study Variables

Prior to beginning the actual study, several individuals provided input as to the variables which would

be of interest to consider. As a result of these discussions and the literature reviewed to date, a number of variables were initially identified to be collected.

4. The Data

The first source of study data was the database of the case management firm. Further investigation, however, showed that this database was not as accurate and up-to-date as initially thought. With this being the situation a data collection sheet was developed. A copy of the collection sheet is included in Appendix A.

The data collection sheets were filled out by a registered nurse hired by the employer for this specific task. The procedure was to use the employer's records to complete as many of the items as possible. Any missing items would be filled in by using the original records maintained by the management firm. After reviewing both sets of records, all available data concerning the identified 48 variables was collected.

Of the 48 variables collected, 12 were used in the analysis. These included: age, gender, marital status, whether the patient was an employee or dependent, the date of onset of the medical condition, the date the case was opened by the management firm, the date closed, total dollars invoiced, the projected dollar savings, whether the case was considered acute or chronic, the method of

notification to the management firm, and the type of case (surgical, medical, chemical dependency, mental health, or neonatal). It was believed that these 12 variables had the greatest potential for explaining the variance of the dependent variable.

The 36 variables that were not used in the analysis fell into one of several categories. For some (such as major procedures and major treatments) very little data was available. Other variables such as the patients name and address were recorded for possible use in a satisfaction survey at a later date. A third group of variables were collected to determine how the management firm was spending its time in the process of managing the case.

The Dependent Variable

"Net Savings"

"Net savings" was selected as the dependent variable for this analysis. The main focus of this study was to examine whether case management was cost effective. As discussed in the previous chapter, little actual data was available to answer this question. In order to arrive at the "net savings", both the total management fee and the total projected savings for the next year were required. In order for these variables to be available, each case considered in the analysis had to be closed prior to 1 April 1987.

Conceptually "net savings" is the amount of money the employer saved as a result of using case management. The savings reflect the result of case management intervention. If savings took place that were not a result of the direct intervention of the management firm, then it was not considered to have been a "savings".

Operationally "net savings" is defined as the total projected savings for a specific case (up to one year) minus the amount charged for the service. This result can be a negative number since some cases have a zero savings.

"Net savings" ranged from a -\$3,700 to a positive \$91,939. The mean value was \$4,829 with a median of -\$167 and a standard deviation of \$14,656. A total of 70 valid cases was used in the analysis. No cases were missing. Of the 70 cases, 48 had negative saving while 22 had a positive saving. Only nine cases resulted in a savings greater than \$10,000.

Independent Variables

The independent variables used in the analysis include the following (see Table 1):

1. The Time a Case is Opened

The time interval available for analysis was the amount of time a case was actively managed by the firm. Of the 70 cases only two had missing dates. This variable considered

the time in terms of months. The time opened for a case was not addressed in any of the literature.

Operationally the actual number of days was determined from the date of referral to the date of closing. The number of days was then divided by 30.4375 to determine the number of months a case was open. The result of the previous division was then rounded. Due to rounding, the number 1 actually represents Values between .5 and less the 1.5.

The number of valid cases for this variable was 68 with 2 missing values. The mean was 3.618, with a standard deviation of 3.346 and a variance of 11.195. This variable had a range from 0 to 12 and a median of 2.700.

2. Method of Notification

In identifying cases to be considered for management, a feeling existed that an occupational health nurse would have more success at identifying more appropriate cases for management than other methods of referral which exist within the employer's company.

This variable refers to how the case was originally identified for consideration to be managed. A number of channels are available to refer a case to the management company. This analysis will consider five specific sources of notification: occupational health nurse, the human

resource director, a transplant diagnosis, a company physician, and preadmission certification.

The number of valid cases for this variable was 67 with three missing cases. Of the 67, occupational health nurses referred 16 cases, human resource directors referred 11. Only 1 case was a transplant diagnosis, 1 was referred by a company physician, preadmission certification resulted in referral of 23 cases while the remaining 15 cases fell into the "other" category.

3. Corporate verses Field

As noted earlier, the cases studied were made available by a Fortune "500" company that divided its employees into two categories: corporate or field. An employee is identified as a corporate employee if he/she is associated with the manufacturing and distribution of the product. Also a corporate employee has access to an occupational health nurse. On the other hand, a field employee is one associated with service of the product after the point of sale. He/She may be remotely located in relation to the manufacturing and distribution centers. Therefore a field employee may not have access to an occupational health nurse or some of the other support services provided by the employer.

Since a separate office manages the two groups of cases, the employer identified the patient as belonging to either the corporate or the field group.

All 70 cases were included in this variable. Corporate cases represented 23 of the 70 while 47 were field cases.

4. Employee or Dependent

This variable identified whether the patient was an employee of the company or a dependent. Of the 70 cases used in the analysis, 20 were employees while 50 were dependents.

5. Acute verses Chronic Case

An acute case is one where the length of illness is relatively short and complete recovery is generally expected. Chronic is the opposite, where the patient is dealing with a prolonged episode of illness. In many cases the condition progressively gets worse leading to still further problems.

While the management company had identified a few of the cases as being chronic, others were evaluated by the registered nurse hired by the employer and categorized as either acute or chronic. The basis of the decision included the primary diagnosis provided by the management firm. Of the 70 cases studied, 21 were classified as acute and 49 chronic.

6. Age

Age was the age of the patient at the time the case was opened by the management firm. The values for this variable were expressed as whole numbers with a range of 0 to 65. Any patient less than one year of age was assigned as age of 0.

For this analysis, age was divided into two groups. The first group consisted of patients less than 45 years old, while the second group included all patients 45 or older.

The mean age of the patient was 32.6 years, the median age was 35.5 years with a standard deviation of 19.7. All 70 cases were used in the analysis.

7. Gender

Cases were also differentiated by gender. In all, males accounted for 31 cases and 39 were females.

8. Marital Status

The patients were identified as being either single, married, widowed, or divorced / separated. For the analysis a distinction is made between two groups; married verses not married.

For marital status, four categories were initially collected. Single patients accounted for 30, married for

37, widowed for 2, and divorced or separated for 1. Again, all 70 cases were used in the analysis.

9. Type of Case

The final independent variable was the type of case. Each case was assigned to one of five categories based upon the primary diagnosis assigned by the management company. These categories were: surgical, medical, chemical dependency, mental health, and neonatal. For purposes of the analysis, each case had to be classified into one of five categories. If the primary diagnosis was major depression with a secondary diagnosis of chemical abuse, the case was classified as mental health, not chemical abuse.

This categorization was performed by the registered nurse hired by the employer. Although some cases had multiple diagnoses, only one was considered primary and that diagnosis was used to determine this variable.

For the variable type of case, all 70 cases were included. Of these, 6 were surgical, 31 medical, 5 chemical, 24 mental, and 4 neonatal.

10. The Time From the Date of Onset to Date of Referral

One of the variables discussed throughout the literature which was mentioned as having a strong direct relationship with "net savings", was the time from the date of onset of the medical condition to the date of referral.

Therefore, these two dates were sought on as many of the cases as possible.

This variable was considered to be the one which would discriminate the best between the cases with "net savings" verses those without "net savings". Unfortunately, data on this variable was missing on approximately half of the cases. During discussions with several members of the program faculty, the decision was made to eliminate this variable since the number of missing cases would make the sample size too small. As a result, this study will not be able to test the hypothesis that the closer the referral to date of onset, the larger the "net savings".

TABLE 1
Table of Variable
Descriptions and Coding

<u>Variable</u>	<u>Description</u>	<u>Code</u>
Dependent		
1. "Net savings"	The result of subtracting the amount invoiced from the total projected savings provided by the management company.	actual value of dollars
Independent Variables		
1. Time case was opened	This is the amount of time between the open date and the close date.	number of months

 TABLE 1 (CONTINUED)

2. Method of notification	This variable identifies the method by which the case management firm learned about the case for possible management. The other category includes those cases which did not fit into the first five.	1=occupational health nurse 0=human res. director 0=transplant diagnosis 0=company physician 0=preadmission certification 0=other
3. Corporate or Field	This variable indicates whether the case was a corporate or a field case. The distinction is whether the patient is involved in the manufacturing and distribution of the product (corporate) verses service after the point of sale (field). Also an employee identified as corporate has access to an occupational health nurse.	1=corporate 0=field
4. Relationship to employer	This variable identifies the patient as either an employee or a dependent of an employee.	1=employee 0=dependent
5. Case classification	This indicates whether the case was a acute episode or a chronic one.	1=acute 0=chronic
6. Age of patient	This is the age of the patient at the time the case was referred to the management company. If the patient was less than one year old, it was assigned an age of 0.	whole numbers
7. Gender	This is the gender of the patient.	1=male 0=female

 TABLE 1 (CONTINUED)

8. Marital status	This is the marital status of the patient.	1=married 0=single 0=widowed 0=divorced separated
9. Type of case	This variable identifies each case as belonging to one of five kinds of cases based upon the primary diagnosis. The five categories include: medical, surgical, mental health, chemical dependency, and neonatal. Each category is separate requiring a yes/no response. Only one category in the five will be coded "yes" for each case.	1=yes 0=no
10. Elapsed time from date of onset to date of referral	This variable identifies the amount of days from the date of onset to the date the case was opened by the management firm.	number of months

Problems Encountered Which
Changed the Focus of the Study

Several obstacles were encountered in trying to get the actual cost of the medical care provided relative to the diagnosis being managed. These problems became so insurmountable that this piece of data was determined unattainable. The barriers are interesting and may spark some thought in trying to remedy the situation in the future. For this reason the following is a discussion of the obstacles encountered.

1. Problems Deriving the Cost of Medical Care for the Patient Being Managed

First, the cost data associated with the medical care of the patient being managed was not centrally located. In trying to obtain these data, one must include all costs of physicians, drugs, needed outpatient services, inpatient services, ambulance services if used, various specialists involved in the case, and the out-of-pocket costs paid by the patient for medical care before the insurance reimbursement begins to pay. Also in the cost category would be any services or materials not covered by insurance. These too should be included in the actual cost of care.

The design was somewhat scaled back to include only those costs the insurance company had actually paid on a particular claim. To this, one could add any copayments and deductibles to the paid amount to determine the actual cost of medical care. This thought was pursued only briefly due to the next obstacle.

2. Problems of Collecting Information From Insurance Companies

This time the problem was more a matter of identifying the insurance company which covered the patient and contacting them for the information. Pursuing this option, a carrier insuring approximately one third of the sample size

was contacted. During preliminary discussions the company stated that a total dollar figure could be provided for each of the clients mentioned. At first this sounded acceptable. But after further thought, it became clear that since there was no way to tell if all the costs included in the figure were related to the case being managed, such an approach was abandoned. If a person was in the hospital, and had several other health care encounters, there was no way to extract the information related to the diagnosis being managed.

Upon further discussion with the employer, it was determined to try asking the same questions in a different way. Upon further discussion with the same insurance carrier, it was discovered that a report could be produced that would include all the required information. The report would be on a month by month basis listing the patient with the associated charges experienced during the month. Such an approach appeared to be promising until it was discovered that if multiple payments were made to different organizations on the same day, only the total would be available. This was considered to be a minor problem, but definitely one that had the potential of causing the information to be invalid. Upon further discussion and reflection, it was decided that the chances of the carrier paying more than one invoice on a specific day, and having one of them unrelated to the actual problem being managed, was slight.

3. The Problem of a Mobile Society

Anticipation was growing as one felt a sense of accomplishment in finally getting this one piece of data. At this point another obstacle to accurate cost data presented itself. With a mobile society, it is possible that a person would not have received all associated care under the same policy. This would especially be the case with employees and/or their dependents having chronic illnesses.

4. Determining the Period of Time Necessary to Assure Valid Cost Data

The validity of the data was in question from the standpoint that only the past two years of paid invoices by the insurance company would be made available. The question of how far back does one go to capture cost data came to the forefront.

At this juncture an arbitrary decision was made to ask for reports from the carrier for the previous three years. At last, values could be filled in for the actual costs of medical care for patients involved in case management. At this point another obstacle became apparent.

5. The Problem of Standardized Insurance Reports

During the last discussion with the carrier, it was mentioned that each of the monthly reports was approximately

500 pages or longer. This would be 6,000 pages for the year or 18,000 pages for the three years. That equates to 36 reams of paper that would have to be reviewed just to get the costs associated with one third of the population. The other 2/3 of the population were represented by 5 other insurance companies. If insurance company A was like insurance company B, the 18,000 pages quickly turned into 108,000 pages or 216 reams of paper. At this point the cost data was determined to be unattainable.

6. Problems With the Primary Diagnosis

The study was originally designed to consider the primary diagnosis of the patient. This piece of data also had its problems. The management company had originally coded the cases based upon their own system. This they rectified by recoding all the cases with the appropriate ICD-9 code. However, the codes given do not necessarily agree with the code assigned by the physician.

This variable, however was not included in this analysis due to the small sample size of 70. It was entered into the database in anticipation of additional cases being included at a future date.

7. Management Company Charges

The cost charged by the management firm was another piece of information of interest to the study. During the

initial discussions of the study with the management firm, it was pointed out that a database existed and was maintained by the company. Most of the data items needed for the study were included in the database. The company was very cooperative and helpful in getting the information in the database on all the elements of interest for the specific employer's cases.

Once those data items were printed from the database, the accuracy of the information was checked with the original files. After selecting several files, it was determined that the data contained in the database were not accurate. This necessitated getting all data from the patient's actual record. To do this task a registered nurse was hired by the employer to complete the collection sheets designed for the study. The reason a registered nurse was hired was in anticipation of having to extract data from nursing reports generated by the management firm. During this process, however, another problem surfaced.

8. Problem of Assembling a Complete Data Set

Using the employers files, the data were compiled from the various cases. Some of the data being collected was not available in the files maintained by the employer. At this time the original files were pulled at the management company to provide missing information. Due to the information available it was difficult to account for all

the invoices. During the process of reviewing the original files, duplicate and triplicate copies of documents were contained within many files. This made it time consuming in gathering the necessary data.

During the data collection period, the data available at the employer differed greatly between the two offices responsible for the files. One of the offices had 95 percent of the paperwork forwarded from the management company. The other office had less than 50 percent of the data forwarded. Granted, it would have been easier for this study if a copy of all documents sent by the management company had been maintained, but one cannot fault the employer for not doing this since the retained documents, met the employer's perceived needs.

Analytic Techniques Used

This analysis will use two techniques to analyze the data. A discussion of each of the techniques follows.

1. Chi-square.

Using the Chi-square analysis, the hypothesized relationship between the dependent variable ("net savings") and each of the independent variables was tested. A Chi-square score that is significant indicates that a relationship exists between the dependent and the independent variable being tested.

The results of the Chi-square analysis are presented in Chapter 3.

2. Multiple Linear Regression.

The multiple linear regression technique looks at the independent variables in combination to explain the variance in the dependent variable. Each independent variable is included in the equation based upon it being the best explainer of the variables waiting to be included in the equation. The effectiveness of the regression function is measured by R^2 , the proportion of the variance in the dependent variable that is explained by the weighted sum of the independent variables.

Some of the independent variables may make such a small contribution to the regression function that their retention in the equation is not justified. All variables that do not satisfy the following criteria will be excluded:

- 1) Each variable must add at least 2% to the explained variance (R^2) of the dependent variable
- 2) The p-value of the change in R^2 when the variable is added must be no greater than .05.

Discussion of Limitations

The current research has several limitations. First, the sample size is relatively small. This was due to using

one employer's cases. Also, as a result of the sample size, an analysis based upon ICD-9 codes was not possible.

Another limitation was brought about by the inaccuracy of the management firm's database. Had the database been current and accurate, the number of cases available for analysis would have greatly increased. Instead of having to analyze each individual patient record in order to collect accurate data, the time spent on data collection could have been used more productively. A number of additional research questions could have been written and analyzed.

During the initial design of the study, the actual cost of medical care received by the patients, was to be included in the analysis. This data as described was deleted as it was unattainable, thus limiting the overall analysis.

A final limitation experienced was the problem of missing data. An example was the date of onset. This became critical in considering the hypothesis dealing with the amount of time between onset and referral. Due to the number of onset dates missing, this variable and related hypothesis had to be disregarded from the analysis.

As one does research of this nature, one must learn to work with what is available. In very few instances will a person ever have complete information. Therefore, problems and limitations must be dealt with in an appropriate manner.

Chapter 3

PRESENTATION AND ANALYSIS OF DATA

Data Analysis

This chapter will present the analysis of data and its interpretation. The actual analysis was performed using a Chi-square test for association between the dependent variable "net savings" and each of the independent variables. A second analysis was performed using a multiple linear regression.

The first research question was, Is case management cost effective from the employers perspective? The analysis revealed that 70% of the cases (48) showed a "negative net savings" while the remaining 30% showed a "positive net savings". The total projected savings for the 70 cases was \$413,749.00 while the total amount invoiced for the management services was \$75,672.

Although 70% of the cases resulted in "negative net savings", based upon the projected savings by the management firm, for every \$1.08 spent on management fees, \$4.83 was saved in projected medical cost.

Chi-Square Analysis

Crosstabulation and Chi-square analyses were performed to test for statistically significant relationships between the various demographic and case characteristics of patients (independent variables) and "net savings" (dependent variable) generated as a result of the case being managed. Following the presentation of each hypothesis one will find the crosstabulation, the Chi-square value, degrees of freedom, the p value of significance and the number of cases included. For a summary of the results refer to Table S-1.

Hypothesis 1:

Length of time from the date the case was opened to the date the case was closed. The length of time from the date the case was opened to the date it was closed will be directly related to "net savings".

Table H-1
Analysis of Relationship Between the Length of Time a Case
is Opened and "Net Savings"

Time Opened in Months	"Net Savings"			
	negative		positive	
	F	%	F	%
0-1 months	22	(88)	3	(12)
2-4 months	16	(76)	5	(24)
5+ months	8	(36)	14	(64)

$\chi^2 = 15.26$; d.f. = 2 ; significance = .0005 ; N = 68				

An analysis of the data presented in Table H-1 reveals that as the length of time a case is opened increases, the possibility of savings increases. Thus while 70% of the cases opened more than five months resulted in "net savings", only 12% of those opened one month or less did so. As a result, the null hypothesis is rejected and the hypothesis of a direct relationship between the length of time a case is opened and "net savings" is accepted.

Hypothesis 2:

Method of notification. Method of notification is directly related to "net savings" when the notification comes through an occupational health nurse.

Table H-2
Analysis of Relationship Between the Methods of
Notification and "Net Savings"

Method of Notification	"Net Savings"			
	negative		positive	
	F	%	F	%
Preadmission Certification	17	(74)	6	(26)
Occupational Health Nurse	11	(69)	5	(31)
Other	20	(65)	11	(35)
$\chi^2 = .54131$; d.f. = 2 ; significance = .7629 ; N = 70				

In contrast to the proposed hypothesis, there was no significant relationship between the method of notification and "positive net savings" (see Table H-2). About one third of the cases referred by each of the two methods resulted in "positive net savings" while two thirds resulted in "negative net savings".

One possible explanation is that the occupational health nurses are not as concerned with the amount of money saved by case management as with the patient's need for the service. This could also be the reason the other groups identified show similar results.

Hypothesis 3:

Patients classified as corporate verses field. The patients classified as corporate will be directly related to "net savings".

Table H-3
Analysis of Relationship Between the Classification
of Patients and "Net Savings"

Patient Classification	"Net Savings"			
	negative		positive	
	F	%	F	%
Corporate	14	(61)	9	(39)
Field	34	(72)	13	(28)

$\chi^2 = .94287$; d.f. = 1 ; significance = .3315 ; N = 70				

As can be seen in Table H-3, there appears to be no significant association between the classification of patients as either corporate or field and "net savings", thus the working hypothesis is rejected.

Approximately one third of the cases classified as corporate or field resulted in positive savings while the remaining two thirds resulted in negative savings.

One possible explanation is that neither type of office is taking aggressive action to better identify cases for management.

Hypothesis 4:

Patients classification as employee verses dependent.

Patients classified as employee will be directly related to "net savings".

Table H-4
Analysis of Relationship Between the Classification
of Patients and "Net Savings"

Patient Classification	"Net Savings"			
	negative		positive	
	F	%	F	%
Employee	14	(70)	6	(30)
Dependent	34	(68)	16	(32)

$\chi^2 = .02652$; d.f. = 1 ; significance = .8706 ; N = 70				

There appeared to be no significant association between the patient's classification as either employee or dependent and "net savings" obtained through case management. As the analysis in Table H-4 shows, about 30% of both the employees and dependents resulted in "positive net savings" while the remaining 70% resulted in "negative net savings". The only potential explanation for this result is that in actuality there is no significant difference between the two groups of patients in terms of their over-all cost of health care.

Hypothesis 5:

Patient illnesses classified as chronic verses acute.

The number of chronic patients will be directly related to "net savings".

Table H-5
Analysis of Relationship Between the Classification
of Patient illness and "Net Savings"

Classification of Patient Illness	"Net Savings"			
	negative		positive	
	F	%	F	%
Acute	16	(76)	5	(24)
Chronic	32	(65)	17	(35)

$\chi^2 = .80808$; d.f. = 1 ; significance = .3687 ; N = 70				

On the basis of the data presented in Table H-5, the null hypothesis is accepted and the working hypothesis

stated above rejected. Although chronic patients were somewhat more likely (35%) than acute (24%) to achieve "net savings" the difference was not statistically significant.

Hypothesis 6:

Age. Age will be directly related with "net savings."

Table H-6
Analysis of Relationship Between the Age
of Patients and "Net Savings"

Patient Age	"Net Savings"			
	negative		positive	
	F	%	F	%
0 - 44	31	(74)	11	(26)
45 +	17	(61)	11	(39)

$\chi^2 = 1.33681$; d.f. = 1 ; significance = .2476 ; N = 70				

The results of the crosstabulation shown above (Table H-6) revealed that although a larger percentage (39%) of the patient's that were above 45 years of age resulted in a "positive net savings" than those below 45 (26%), the differences were not statistically significant and the working hypothesis must be rejected: on the whole, the care of both age groups resulted in "negative net savings".

Hypothesis 7:

Gender. Patients of the male gender will be directly related to "net savings".

Table H-7
Analysis of Relationship Between the Gender
of the Patient and "Net Savings"

Gender	"Net Savings"			
	negative		positive	
	F	%	F	%
Male	26	(84)	5	(16)
Female	22	(56)	17	(44)

$\chi^2 = 6.04344$; d.f. = 1 ; significance = .0140 ; N = 70				

While it was hypothesized that men would be more likely to achieve "positive net savings" from the program than women, just the opposite was found. Females were about three times as likely to achieve a "positive net savings" than their male counterparts (see Table H-7).

One possible explanation for these unexpected results is that the longer managed cases are composed of a significantly larger proportion of women than men.

Hypothesis 8:

Marital status. Patients who are married will be directly related with "net savings".

Table H-8
Analysis of Relationship Between Marital Status
of the Patient and "Net Savings"

Marital Status	"Net Savings"			
	negative		positive	
	F	%	F	%
Married	23	(62)	14	(38)
Other	25	(76)	8	(24)

$\chi^2 = 1.49601$; d.f. = 1 ; significance = .2213 ; N = 70

As can be seen in Table H-8, there was no significant association between marital status and "net savings" and the working hypothesis is rejected.

One possible explanation is that the management company does not take advantage of using a spouse to provide support and care as soon as possible. In other words, being married does not mean that the patient will be discharged sooner.

Another possible explanation is that since 56% of the cases evaluated were women and the age of the patients was 65 or less, the male spouse would still be working full time therefore unable to care for his wife at home.

Hypothesis 9:

Type of case. Patients who are managed for each of the five conditions (surgical, medical, chemical, mental, and neonatal) are likely to achieve a "positive net savings".

Analysis of the data presented in Tables H-9-1 through H-9-6 fails to support this hypothesis. There was no

significant relationship between type of case and "net savings" achieved.

Table H-9-1
Analysis of Relationship Between Type of Case
and "Net Savings"

Type of Case	"Net Savings"			
	negative		positive	
	F	%	F	%
Surgical	4	(67)	2	(33)
Non-surgical	44	(69)	20	(31)

$\chi^2 = .01105$; d.f. = 1 ; significance = .9163 ; N = 70

Table H-9-2
Analysis of Relationship Between Type of Case
and "Net Savings"

Type of Case	"Net Savings"			
	negative		positive	
	F	%	F	%
Medical	22	(71)	9	(29)
Non-medical	26	(67)	13	(33)

$\chi^2 = .14826$; d.f. = 1 ; significance = .7002 ; N = 70

Table H-9-3
Analysis of Relationship Between Type of Case
and "Net Savings"

Type of Case	"Net Savings"			
	negative		positive	
	F	%	F	%
Chemical	5	(100)	2	(00)
Non-chemical	43	(66)	22	(34)

$\chi^2 = 2.46795$; d.f. = 1 ; significance = .1162 ; N = 70

Table H-9-4
Analysis of Relationship Between Type of Case
and "Net Savings"

Type of Case	"Net Savings"			
	negative		positive	
	F	%	F	%
Mental	14	(58)	10	(42)
Non-mental	34	(74)	12	(26)

$\chi^2 = 1.77623$; d.f. = 1 ; significance = .1826 ; N = 70

Table H-9-5
Analysis of Relationship Between Type of Case
and "Net Savings"

Type of Case	"Net Savings"			
	negative		positive	
	F	%	F	%
Neonatal	3	(75)	1	(25)
Non-neonatal	45	(68)	21	(32)

$\chi^2 = .06135$; d.f. = 1 ; significance = .7755 ; N = 70

The null hypothesis of no association is accepted and the working hypothesis is rejected. Of the 5 types of cases studied, none were found to be significantly associated with the dependent variable of "net savings".

Hypothesis 10:

Length of time from the date of onset to the date the case was referred to the management company. While it was originally hypothesized the length of time from the date of onset to the date the case was referred to the management

company would be directly associated with "net savings", due to the large number of missing dates it was not possible to test this hypothesis.

Table S-1

Summary table for Chi-square analysis
between each of the independent variables
and the dependent variable "net savings"

<u>Hypothesis</u>	<u>Independent Variable</u>	<u>χ^2</u>	<u>p value</u>	<u>d.f.</u>	<u>N</u>
H1 *	Length of time case managed	15.26980	.0005	2	68
H2	Method of notification	.54131	.7629	2	70
H3	Corporate vs field	.94287	.3315	1	70
H4	Employee vs dependent	.02652	.8706	1	70
H5	Chronic vs acute	.80808	.3687	1	70
H6	Age	1.33681	.2476	1	70
H7 *	Gender	6.04344	.0140	1	70
H8	Marital status	1.49601	.2213	1	70
H9	Type of case:				
	Surgery	.01105	.9163	1	70
	Medical	.14826	.7002	1	70
	Chemical	2.46795	.1162	1	70
	Mental	1.77632	.1826	1	70
	Neonatal	.06135	.7755	1	70
H10	Length of time from onset to referral	Not tested because of lack of data			

* Significant at the < .05

Of all the variables examined, only two (the length of time from the date the case was opened to the date the case was closed and the gender of the patient) were found to be

significantly related to "net savings" and one of these was in the opposite direction than expected. Females instead of males were found to be directly related to "net savings."

Multiple Linear Regression

After considering the association or lack of association between each of the independent variables and the dependent variable, we now will examine which if any explains "net savings" best.

Hypothesis 11:

A linear combination of two or more of the independent variables given in the hypothesis above will explain the "net savings" of case management - and in the same direction as hypothesized above. This analysis includes both positive and negative values of "net savings."

The independent variables used in the Chi-square analysis (time opened in months, method of notification, classification of patient as either corporate or field, classification of patient as employee or dependent, classification of patient illness as either chronic or acute, age, gender, marital status, and type of case) were included in the multiple linear regression. Refer to Table S-2 for a summary of the independent variables considered in the analysis, the hypothesized relationship and the coding of the variables.

Table S-2
Summary of Independent variables and the Hypothesized
Relationship for Hypothesis 11,12, & 13

Independent variable	Relationship to dependent variable	Method of coding values
Time case opened	Direct	actual months
Method of notification	Direct	1 = occupat health nurse 0 = other
Corporate vs field	Direct	1 = corporate 0 = field
Employee vs dependent	Direct	1 = employee 0 = dependent
Acute vs chronic	Direct	1 = acute 0 = chronic
Age	Direct	age in whole years at time of referral
Gender	Direct	1 = male 0 = female
Marital status	Direct	1 = married 0 = other
Type of case		1 = yes 0 = no
Surgical	Direct	
Medical	Direct	
Chemical	Direct	
Mental	Direct	
Neonatal	Direct	

Interpretation of MLR using all 70 cases

The analysis concerning the regression which included all of the cases is summarized in Table H-11-1. When combined, the independent variables explain 32.45% of the dependent variable's variance and the p-value of the equation is = .0210.

Table H-11-1
Stepwise Multiple Linear Regression of
"net savings" (using all 70 cases)

Step value	Independent Variable	Standardized Weight	Simple R	R ²	R ² Change	p Change
1	Time opened	.49967	.4942	.2443*	.2443	.0000
2	Gender	-.18962	-.2076	.2727	.0284	.125
3	Corp vs field	-.18846	-.0783	.2941	.0214	.179
4	Surgical	.05430	.0657	.3081	.0140	.275
5	Chemical	-.12890	-.1212	.3136	.0055	.494
6	Emp vs dep	-.06006	-.1192	.3186	.0050	.515
7	Mental	-.13638	-.0481	.3218	.0031	.609
8	Medical	-.09537	-.0119	.3231	.0013	.744
9	Marital stat	.05654	.1035	.3243	.0012	.754
10	Age	-.02685	.0545	.3245	.0002	.901
11	Notify	.00373	.0915	.3245**	.0000	.982

* p = .0000

** p = .0210

The application of the selection criteria stated in the methodology section leads to the following regression function (using unstandardized weights):

$$E(Y) = -1652.31436 + 1544.78014 X_1,$$

where

$E(Y)$ is the expected value of "net savings",

X_1 is the number of months the case was opened.

This one independent variable explains 24.4% of the dependent variable's variance. The corresponding p-value is .0000, and therefore the null hypothesis is rejected.

The sign of an independent variable's weight can be interpreted as the direction of its relationship to the dependent variable. The one variable in the above function

(time a case was opened) has a positive weight, as hypothesized. This means that the variable is directly related to the dependent variable. The weight for the number of months opened, 1544.78014, means that on the average, for each additional month a case is opened by the management firm, the employer can expect \$1,544 more in savings.

Interpretation of MLR using 48 cases

The analysis concerning the regression as limited to the cases which resulted in a "negative net savings" are summarized in Table H-11-2. When combined the independent variables explain 59.30% of the dependent variable's variance and the p-value of the equation is = .0014.

Table H-11-2
Stepwise Multiple Linear Regression of
"net savings" ("net savings" less than 0)

Step value	Independent Variable	Standardized Weight	Simple R	R ²	R ² Change	p Change
1	Time opened	-.83711	-.7048	.4967	.4967	.0000
2	Gender	.21504	.0273	.5369*	.0401	.067
3	Neonatal	-.14639	-.0042	.5489	.0121	.307
4	Surgical	-.08877	.0709	.5594	.0105	.340
5	Notify	-.25376	.1047	.5691	.0097	.361
6	Corp vs fld	-.16150	-.0694	.5769	.0078	.414
7	Marital stat	-.17051	-.0536	.5826	.0056	.491
8	Chemical	-.08225	.0292	.5871	.0045	.540
9	Acute vs chr	.06601	.2576	.5895	.0024	.657
10	Age	.13830	-.0367	.5908	.0013	.751
11	Emp vs dep	-.06115	-.0401	.5927	.0020	.697
12	Mental	.02101	-.1398	.5930**	.0003	.885

* p = .0000

** p = .0014

With all of the independent variables listed above, they explain 59.3% of the variance in the dependent variable. This regression included only those cases that had resulted in a "negative net savings".

The application of the selection criteria stated in the methodology section leads to the following regression function (using unstandardized weights):

$$E(Y) = -276.35638 - 199.82979 X_1 + 276.42908 X_2$$

where

$E(Y)$ is the expected value of "net savings",

X_1 is the number of months the case was opened,

X_2 is the gender of the patient (1=male, 0=female).

This combination of independent variable explains 53.7% of the dependent variable's variance. The corresponding p-value for the equation is .0000, and therefore the null hypothesis is rejected.

The sign of an independent variable's weight can be interpreted as the direction of its relationship to the dependent variable. The coefficient in the above function (time a case was opened) has a negative weight, opposite the hypothesized direction. This means that the variable is inversely related to the dependent variable. The weight for the number of months opened, -199.82979, means that on the average, for each additional month a case is opened by the management firm, the employer can expect to lose an

additional \$199.83 in savings. This analysis was performed on only those cases that resulted in a "negative net savings".

The coefficient for the variable X_2 is positive. This means that for those patients whose gender is male, on the average "net savings" is increased by \$276.43. This increase in "net savings" is completely off-set by the negative constant in the function.

Considering an example of the above function when a case is opened 1 month and the gender of the patient is male.

$$E(Y) = -276.35638 - 199.82979 X_1 + 276.42908 X_2$$

Substituting 1 for X_1 and 1 for X_2 the equation becomes

$$E(Y) = -276.35638 - 199.82979 + 276.42908$$

and the expected value for "net savings" is -\$198.77.

Interpretation of MLR using 22 cases

The analysis concerning the regression as limited to the cases which resulted in a "positive net savings" are summarized in Table H-11-3. When combined, the independent variables explain 52.6% of the dependent variable's variance and the p-value of the equation is = .5675.

Table H-11-3
Stepwise Multiple Linear Regression of
"net savings"(greater than 0)

Step value	Independent Variable	Standardized Weight	Simple R	R ²	R ² Change	p Change
1	Time opened	.67232	.4622	.2136	.2136	.035
2	Corp vs field	-.80211	-.3038	.3550 ¹	.1414	.062
3	Acut vs chron	-.35415	-.2190	.4240	.0690	.172
4	Surgery	.08444	.0682	.4532	.0292	.369
5	Emp vs dep	.24556	-.2506	.4680	.0148	.528
6	Gender	.26008	-.0806	.4822 ²	.0142	.545
7	Age	.16490	-.0679	.5021	.0199	.484
8	Notify	-.10488	.2688	.5113	.0092	.643
9	Neonatal	.09341	-.0832	.5177	.0064	.711
10	Mental	-.08516	-.1483	.5217	.0041	.777
11	Marital stat	.09516	.0554	.5260 ³	.0042	.783

1:p = .0193

2:p = .1086

3:p = .5675

With all of the independent variables listed above, they explain 52.6% of the variance in the dependent variable.

The application of the selection criteria stated in the methodology section leads to the following regression function (using unstandardized weights):

$$E(Y) = 5578.39173 + 2033.91297 X_1 - 11,284.701 X_2$$

where

$E(Y)$ is the expected value of "net savings",

X_1 is the number of months the case was opened,

X_2 is whether the case was classified as corporate or field (1=corporate, 0=field).

This combination of independent variable explains 35.5% of the dependent variable's variance. The corresponding p-value for the equation is .0193, and therefore the null hypothesis is rejected.

The sign of an independent variable's weight can be interpreted as the direction of its relationship to the dependent variable. The coefficient in the above function (time a case was opened) has a positive weight. This means that the variable is directly related to the dependent variable. The weight for the number of months opened, 2033.91297, means that on the average, for each additional month a case is opened by the management firm, the employer can expect to save an additional \$2,033.91. This analysis was performed on only those cases that resulted in a "positive net savings".

The coefficient for the variable X_2 is negative. This means that for those patients classified as corporate, on the average "net savings" is increased by \$11,284.70. This decrease in "net savings" is partially off set by the positive constant in the function.

Consider an example of the above function when a case is opened 1 month and the patient is classified as field.

$$E(Y) = 5578.39173 + 2033.91297 X_1 - 11,284.70 X_2$$

Substituting 1 for X_1 and 0 for X_2 the equation becomes

$$E(Y) = 5578.39173 + 2033.91297$$

and the expected value for "net savings" is \$7,612.30.

Summary of the MLR analysis

The best method of summarizing the results of the MLR analysis is with the help of table S-3. This shows the actual relationship which exists between the independent variables and the dependent variable as the set of cases analyzed changed.

One will notice that a direct relationship was hypothesized between the dependent variable "net savings" and each of the independent variables that had a coding of 1 for the analysis. Refer to Table 1 for the coding of each independent variable.

The first regression resulted in 3 variables with the directional relationship as hypothesized and type of case being surgery in the direction hypothesized. The second regression resulted in 3 different variables with the directional relationship as hypothesized and type of case being mental in the direction hypothesized. The third regression resulted in 5 variables with the directional relationship as hypothesized and type of case being either surgical or neonatal in the direction hypothesized (see Table S-3).

The time a case was opened was significant in all three of the regressions. The second regression added gender as a significant variable while in the third regression, gender

was replaced by the variable identifying the patient as either corporate or field.

Table S-3
Summary of Independent variables with the Hypothesized and Actual Relationship for Hypothesis 11,12, & 13

Independent variable	Hypothesized Relationship to Dependent variable	Actual Relationship to Dependent Variables		
		Reg 1	Reg 2	Reg 3
		=====	=====	=====
Time case opened	Direct	D ⁺	I ⁺	D ⁺
Method of notification	Direct	D	I	I
Corporate vs field	Direct	I	I	I ⁺
Employee vs dependent	Direct	I	I	D
Acute vs chronic	Direct		D	I
Age	Direct	I	D	D
Gender	Direct	I	D ⁺	D
Marital status	Direct	D	I	D
Type of case				
Surgery	Direct	D	I	D
Medical	Direct	I	*	*
Chemical	Direct	I	I	**
Mental	Direct	I	D	I
Neonatal	Direct	*	I	D

Reg 1 - Regression with all 70 cases

Reg 2 - Regression with 48 negative cases

Reg 3 - Regression with 22 positive cases

+ - Identifies the significant variables for each regression

* - not allowed in the equation

** - no case classified as chemical dependency resulted in a "positive net savings"

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MEDICAL CASE MANAGEMENT: IS IT COST EFFECTIVE FOR THE
EMPLOYER?(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON
AFB OH D J SWARTZBAUGH JUN 87 AFIT/CI/NR-87-35T

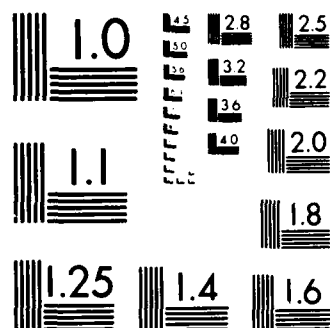
2/2

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NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

Chapter 4

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to answer two questions: 1) Is case management effective for the employer? and 2) What variables predict a "positive net savings" for cases that are managed.

The study took place at a Fortune "500" company, who's national headquarters is located in Minneapolis, Minnesota. This company over the past two years, contracted with a nationally known case management firm for catastrophic case management services. From the beginning of the contract till April 1, 1987, a total of 70 patients had been managed with varying degrees of success in terms of producing a savings to the employer.

An extensive literature review resulted in the identification of only one variable that would have an impact on the "net savings" generated per case. That variable was the time from the date of onset of the treated medical condition to the date of referral to the case management firm. For the analysis however, this variable

was not able to be included since approximately one half of the cases were missing this item.

With no other variables specifically identified as having an impact on "net savings", the author, in conjunction with the employer, selected the independent variables to consider. The final analysis used 12 independent variables.

Statistical analyses were performed on the data using the Statistical Package for the Social Sciences (SPSS). A frequency analysis was done on all of the variables to get an idea of the distribution of each variable being used. This was followed by Chi-square analysis testing each independent variable with the dependent variable "net savings" to determine if a significant association existed. The final analysis was three multiple linear regressions (MLR). The first MLR considered all of the values of the dependent variable "net savings". The second and third equations took a mutually exclusive subset of "net savings". The second regression dealt with only negative values of "net savings" while the third considered only the positive values.

Finally, each of the regression equations was tested using an F test to determine if the regression equation was significant in explaining the variation in the dependent variable, "net savings". The results of the F test on each of the hypotheses were documented and a summary table

showing the results concerning the independent variables was then developed.

Findings

1. Chi-square

During the Chi-square analysis, only two of the associations tested showed significance at the $< .05$ level. The variable with the highest degree of association with "net savings" was the amount of time a case was opened.

Generally speaking, the longer a case is open the higher the "net savings" realized by the employer.

The other independent variable which showed a significant association to the dependent variable was gender. However, the association was in the opposite direction from what was hypothesized, with female directly associated with "positive net savings".

Another interesting observation was the fact that 70% of the cases in the population resulted in a "negative net savings". Also of the cases that resulted in a "positive net savings", nine cases represented "positive net savings" greater than \$10,000 each.

None of the remaining independent variables were significantly related to "net savings".

2. Multiple Linear Regression

Three multiple linear regressions were run using all the independent variables in the analysis. The first regression consisted of 70 cases, the second 48 cases with "negative net savings", and the third the remaining 22 cases with "positive net savings".

While considering all of the cases, only the amount of time opened for a case was viewed as significant using the soft rule. This one variable explained 24.4% of the variance in "net savings" while the entire equation explained 32.4% of the variance with a significant F of .0210 with 11 of the independent variables included.

The second regression was done using only the negative values of "net savings". Two variables proved to be significant, the amount of time a case was opened and gender. Together these variables explained 53.7% of the variance in "net savings" while the entire equation explained 59.3% of the variance with a significant F of .0014 with 12 of the independent variables included.

The final regression, which considered only the positive values of "net savings", showed two variables to be significant; the time a case was opened and whether the case was corporate or field. These variables explained 35.5% of the variation in the dependent variable of "net savings". Instead of corporate cases contributing to the "net savings", they actually decreased the net savings. If

variables are included in the equation up to a significant F of .0664, the amount of variance explained is 46.8%.

Conclusions

The objective of this study was to answer two questions: 1) Is case management cost effective for the employer? and 2) What variables would explain the variation in "net savings"? As a result of this analysis, one would reach several conclusions. These conclusions are discussed below.

To answer the first question, one should consider the mean invoiced amount compared with the mean of the projected savings. In a number of cases this is a subjective analysis which causes the projected savings to be more subjective in nature than one would like. However it is the only available information one can use in this study to consider whether case management is cost effective.

The mean cost for a managed case as considered in this study was \$1,081. The mean projected savings was \$5,911. This means that for every \$1.08 spent on case management activities, \$4.84 was saved. Based upon the subjective estimates of projected savings, one would have to agree that case management is cost effective.

With reference to the fact that 70% of the cases resulted in a "negative net savings", this author believes there are three factors which explain the large percentage

of "negative net savings" cases. First the management company spends an average of 1.86 hours at an hourly rate of \$55.00 during the initial assessment of a case. This assessment is accomplished in the process of evaluating the potential savings of a specific case. Therefore, on the average the management firm spends \$102.30 for the initial assessment.

A second reason for the large percentage of "negative net savings" cases is that the management firm is not at risk. The payment of the invoiced management fee is not contingent upon the case resulting in a "positive net savings". This may be one area of discussion during future negotiations for case management services.

Finally, the criteria being used for the selection of cases to be managed is too encompassing. The criteria used needs further refinements based upon lessons from the cases resulting in "negative net savings".

In regards to the question of trying to identify the variables which explain "net savings", one finds that of the variables selected for analysis, the length of time from when a case is opened to when it is closed is a significant explainer of "net savings". This was the only variable which was found to be significant throughout the various types of analysis. When the regression was performed using only those cases that resulted in "negative net savings", gender became a significant variable. During the third

regression (using only cases with "positive net savings") gender was found not to be significant however, the variable identifying the patient as either corporate or field became significant.

Implications of this analysis are the following.

First, when using the entire data set, positive savings are obtained as the length of time a case is opened increases. In the first regression, neither gender or corporate/field are significant because they tend to cancel each other out.

Recommendations

1. Administrative recommendations for employer

Recommendation 1. A complete file is needed on each patient to include all invoices, all progress reports, and the indication on the return on investment. Unless the office maintaining the file has a copy of all of this material, especially all invoices, it is difficult to determine if an invoice has been paid. During the process of reviewing the records at the management firm, one file had an invoice identical to another invoice except for the date. While upon further investigation there was no indication that double billing had taken place, it is possible that a second invoice could be sent by mistake. Also it is good practice for the office responsible for certifying invoices prior to payment to keep a copy.

Recommendation 2. A standard set of data items identified by employer need to be collected by the management firm.

In the world of today, statistical analysis of data is relatively easy to do if the data are available. Many of the difficulties encountered during this study were obtaining the data. Periodic analysis will help sophisticated buyers of case management services to objectively evaluate the results of the services. As data are collected and analysis performed, it is possible to identify variables which will better indicate potential cases.

Recommendation 3. Develop a form that can go in the front of the patient's folder that can be used to log all documents received. This would include the initial report, monthly progress reports, monthly invoices, a summary report, and a savings report. During periodic audits, missing documents can be requested from the vendor.

This procedure would allow the office to quickly track all reports and be able to answer any questions concerning a specific case. Also when invoices are certified and sent for payment this could be noted as well.

Recommendation 4. When cases with a savings are identified, investigate the reasons for the savings. Ensure that all savings are explained to your satisfaction.

While reading some of the files, it was not clear the sequence of events, therefore determining appropriate savings became complicated. The key question in this area is whether the savings was a result of the direct intervention of the management firm. If the answer is no, then that particular savings figure should not be included. This provides the employer a more objective basis on which to evaluate the performance of a management firm.

Recommendation 5. Examine the projected savings of hospital days made by the management firm.

It is reasonable to believe that a physician will provide a conservative estimate or a slightly inflated one in predicting the length of a hospital stay. If all goes well and the patient is discharged ahead of schedule, the savings may not be a result of direct intervention by the management firm. A determination of why the savings resulted is necessary. If the decrease in hospital days is not a result of the management firms intervention, it should not be identified as a savings resulting from case management.

Recommendation 6. Have another "outside" management company review the patient records to determine if the conclusions reached by the primary management firm are substantiated.

This would provide the employer the opportunity to evaluate the performance of the case management firm. In essence a second opinion would be provided on the estimated "net savings".

2. Administrative recommendations for the case management firm

Recommendation 1. During the process of reviewing the files duplicate and triplicate copies were found. If there is no requirement to keep the original hand written copies and drafts, the file should be purged of extra copies at the time it is closed. This would not only reduce the amount of paper in the files but would also reduce the frustration and confusion when trying to locate a specific report.

Recommendation 2. Keep the database up to date.

Other studies in the area of management information systems have shown that once people determine their needs are not being met by the company's computer system,

employees will begin to keep records and mini-databases on their own. Inaccurate and incomplete information must be minimized or the amount of time necessary for someone to do a given job will ultimately increase.

Recommendation 3. Provide a more objective estimate of savings as a result of case management activities. It is in the management firms interest to collect savings data that is reasonable and understandable to the employer.

The data should be objective rather than subjective in nature. Objective savings can be shown when a private duty RN is replaced by an LPN in a patient's home. This is a savings everyone can agree on. Savings resulting from a diet on the other hand are quite subjective. Also if the savings indicated are more than a 10 to 1 savings or less than a 2 to 1 savings when compared with the total amount invoiced, provide a sound explanation to the employer.

Recommendation 4. When meeting with an employer to review the cases managed during the previous quarter, provide the summary reports at least one week in advance.

For the employer to be convinced of the value of the service from a specific management firm, all of the questions raised by the employer need to be addressed. If

the reports are made available at the time of the meeting, an opportunity for understanding on the employers part is reduced.

As employers become more sophisticated buyers of services, they will require more statistical and descriptive information on which to base their decisions. Case management firms can meet this challenge by developing accurate relational databases that will allow them to provide statistical analyses of cases that have been managed. The future of case management firms will be in their ability to provide evidence of objective positive savings as a result of direct management intervention.

3. Recommendations for Future Research

Since the sample size for this project was relatively small, the author would recommend another study in which the sample size is substantially larger.

Also, it is recommended that the relationship between decreased savings and an increase in the length of time from the date of onset of the treated medical condition to the date of referral be tested.

Since 70% of the cases that have been managed over the past two years have resulted in a net loss, the selection criteria and the mechanism of selecting a case for management need to be re-evaluated. As employers become

more sophisticated buyers of case management services, the number of cases resulting in a "positive net savings" should substantially increase.

This type of study should also include the collection of the costs for the medical care received. Inclusion of the actual cost data would lend more credibility to the idea that case management does result in objective cost savings.

Instead of the researcher collecting the data from the patient files, each of the participating medical directors should be asked to fill out a collection sheet on each patient. The requested data would not be as detailed as this author used. The collection sheet could then be used by the insurance company to identify the control group.

The above changes would make this research more valuable to the field. Also if an employer wanted to know how he/she was doing compared to other companies, this could easily be done by assigning each company a unique code.

APPENDIX A
DATA COLLECTION SHEET

Collection Sheet

Fields

Codes

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CLIENT INFORMATION

Name	_____	_____
Address Line 1	_____	_____
Address Line 2	_____	_____
Zip Code	_____	_____
Case episode(1,2,3)	_____	_____
Age (years)	_____	_____
Sex	_____	_____
Marital Status(S,M,D,W)	_____	_____
Employee/Dependent	_____	_____
IRA File Number	_____	_____
Claims Representative	_____	_____
Number of children	_____	_____
Nature of occupation	_____	_____
Does S. O. work	_____	_____

DATES

Date Disabled (MM/DD/YY)	_____
Date Opened	_____
Date Closed	_____
Months Opened	_____

CARE MANAGER VARIABLES

Total Hours Rendered	_____
Total Hours Billed	_____
Hourly Rate	_____
Hours Phone	_____
Hours Research	_____
Hours Report	_____
Hours Visit	_____
Hours Conference	_____
Hours Consult	_____
Hours Other	_____
Major Procedure 1	_____
Major Procedure 2	_____
Major Procedure 3	_____
Major Treatment 1	_____
Major Treatment 2	_____

COST & SAVINGS

Total Invoiced	_____
Dollar Savings	_____
Return on Investment	_____
Equipment rented or purchased	_____
Equipment cost/____ (wk/mo)	_____

MILEAGE

Miles Rendered	_____	_____
Miles Billed	_____	_____

CODES

Acute vs Chronic	_____	_____
Result Code &	_____	_____
Description	_____	_____
Method of notification	_____	_____
Subjective Outcome	_____	_____

DIAGNOSIS

Primary Diagnosis	_____	_____
Second Diagnosis	_____	_____
Third Diagnosis	_____	_____
Fourth Diagnosis	_____	_____

CATEGORY

Surgery (Y,N)	_____	_____
Medical (Y,N)	_____	_____
Chemical Dependency (Y,N)	_____	_____
Mental Health (Y,N)	_____	_____
Neonatal (Y,N)	_____	_____

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